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# Pollen Systems to Detect Phytotoxicants in the Environment: An Introduction

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There are some special features of pollen systems which I would like to emphasize, and some thoughts on *in vitro* tests and on tests in general that I wish to share.

Our concern for mutagenic, carcinogenic, and teratogenic effects must not be allowed to obscure the fact that there are other health effects of concern. It is also important to keep in mind the possibility of chemicals having serious environmental effects, quite apart from possible effects on human health. The papers at this conference indicate that pollen systems may prove to be of value in the detection of a variety of health and environmental effects of chemicals.

Much has already been said in these sessions about the advantages of pollen systems for rapid testing. Among the attractive features of pollen are:

- Genetic uniformity; haploidy
- Rapid growth (up to several mm/hr) on simple medium
- Ease of storage; continuous availability
- Small size, permitting ease of handling of large numbers
- Availability of ecosystem-specific types
- Limited osmoregulation
- Conspicuous cytoplasmic streaming
- Potential for cell culture and for embryogenesis

An additional potential advantage derives from the fact that several aspects of pollen biology are quite well described in some species. These include fine structure, metabolism, cytochemistry and Golgi body (dictyosome) function. Examination of the effects of chemicals on these subsystems may indicate the mechanism of action of a chemical which inhibits pollen tube growth. Species whose pollen systems have been particularly well studied include petunia, lily, tobacco, and evening primrose.

Environmental effects of chemicals are manifested not only on individual species but on aspects of ecosystem function. Ecosystems are characterized by biological transformations of carbon, nitrogen, oxygen, and other elements through biogeochemical cycles. Potential effects of chemicals on these cycles may be assayed with organisms which are essential to their operation or with *in vitro* systems derived from them.

Ecosystems are also characterized by an intricate web of interactions between the member species, such as host/parasite and predator/prey interactions. Single species tests cannot reveal the effects of chemicals on these systems, yet a chemical which altered the virulence of a pathogen, the resistance of its host, or any other interspecific interaction might thereby have significant environmental effect.

But these are items for the agenda of another conference. Returning to the subject at hand, pollen systems with their recognized limitations may best be viewed as potential components of an array, or battery, of *in vitro* and other tests to be used together as a first tier in a testing sequence. In such a test battery, pollen tube growth may find use in the detection of specific effects, such as mutagenicity, or of nonspecific growth inhibition in flowering plants.

In conclusion, pollen systems offer an array of possibilities for the study of toxic effects which is perhaps unmatched among *in vitro* systems in terms of variety of end points or ease of manipulation. Future efforts in the development of tests for environmental effects must, however, give attention to the need to measure effects on biogeochemical cycles and on species interactions.

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